

Salmonellosis (Non-Typhoid)

*Note: This chapter focuses on salmonellosis that is not typhoid fever. For information about typhoid fever (or salmonellosis caused by *Salmonella typhi*), refer to the chapter titled “Typhoid Fever.”*



Section 1:

ABOUT THE DISEASE

A. Etiologic Agent

Salmonellosis refers to disease caused by any serotype of bacteria in the genus *Salmonella*, other than *Salmonella typhi* (the *Salmonella* species that causes typhoid fever).

A new classification for *Salmonella* has been adopted based on DNA relatedness. This new nomenclature recognizes only two species: *Salmonella bongori* and *Salmonella enterica*, with all human pathogens regarded as serovars within the subspecies of *S. enterica*. For example, the proposed nomenclature would change *S. typhi* to *S. enterica* serovar Typhi, abbreviated *S. Typhi*, and *Salmonella enterica* serovar Enteritidis would be referred to as *S. Enteritidis* instead of *S. enteritidis*.

B. Clinical Description

The most common symptoms of salmonellosis are diarrhea (sometimes bloody), stomach cramps, fever, nausea, and sometimes vomiting. Dehydration may be severe, especially among infants and the elderly, and invasive disease (enteric fever) may occur. The infection may also present as septicemia, abscess, arthritis, or cholecystitis.

C. Vectors and Reservoirs

Salmonella are widely distributed in animals, including livestock, pets, poultry, other birds, reptiles, and amphibians. Most infected animals are chronic carriers. Humans can also be a source of infection.

D. Modes of Transmission

Salmonella are transmitted via the fecal-oral route. The most common mode of transmission is ingestion of food or water that has been contaminated with human or animal feces. This includes raw or undercooked poultry, eggs, and egg products; undercooked meats; and raw milk or milk products. However, any food contaminated with the bacteria can be a source of infection. For example, outbreaks have been traced to the consumption of raw fruits and vegetables contaminated during processing. In most circumstances, contaminated food must be subject to time and temperature conditions that allow reproduction of the bacteria to numbers that can cause disease in those ingesting the contaminated food. A large dose of organisms ($\geq 100,000$) is usually needed to cause infection, but the infectious dose may be lower for certain serovars and for certain susceptible individuals such as children, the elderly, and the immunocompromised. In addition, reptiles such as iguanas and lizards are chronic carriers of these bacteria and can be sources of infection. Person-to-person spread can also occur, especially among household contacts, preschool children in daycare, and the elderly and developmentally disabled living in residential facilities. Transmission can also occur from person to person through certain types of sexual contact (e.g., oral-anal contact).

E. Incubation Period

The incubation period for salmonellosis ranges from 6–72 hours, but is usually about 12–36 hours. However, incubation periods longer than three days have been documented.

F. Period of Communicability or Infectious Period

The disease is communicable for as long as the infected person excretes *Salmonella* bacteria in his/her stool. This can last from days to months, depending on the serovar, but rarely lasts more than one year. Treatment with antibiotics can prolong carriage by suppressing competing bacteria in the gastrointestinal tract.

G. Epidemiology

Salmonellosis has a worldwide distribution, with approximately 1.4 million cases occurring annually in the U.S. About 60–80% of cases are sporadic, but large outbreaks have occurred in institutional settings and from common food sources. The largest common-vehicle outbreak of salmonellosis ever recognized in the U.S. was caused by ice cream made by a national producer from premix that had been transported in contaminated tanker trucks. In Massachusetts, *S. Enteritidis* and *S. Typhimurium* account for over 50% of *Salmonella* serovars isolated.

H. Bioterrorist Potential

Salmonella are listed by the Centers for Disease Control and Prevention (CDC) as Category B bioterrorist agents. If acquired and properly disseminated, *Salmonella* could cause serious public health challenges.



Section 2:

REPORTING CRITERIA AND LABORATORY TESTING

A. What to Report to the Massachusetts Department of Public Health (MDPH)

Report isolation of *Salmonella* species from any clinical specimen.

Note: For Salmonella Typhi, see the chapter titled “Typhoid Fever.” See Section 3C for information on how to report a case.

B. Laboratory Testing Services Available

The MDPH State Laboratory Institute (SLI), Enteric Laboratory will test stool specimens for the presence of *Salmonella* and will perform confirmatory testing and serotyping on isolates from clinical specimens submitted by other laboratories. In addition, the SLI Enteric Laboratory requests submission of all *Salmonella* isolates for serotyping for disease surveillance purposes. For more information, contact the SLI Enteric Laboratory at (617) 983-6609.

The SLI Food Microbiology Laboratory will test implicated food items from a cluster or outbreak. See Section 4 for more information or call the SLI Food Microbiology Laboratory at (617) 983-6616.



Section 3:

REPORTING RESPONSIBILITIES AND CASE INVESTIGATION**A. Purpose of Surveillance and Reporting**

- ◆ To identify whether the case may be a source of infection for other persons (e.g., a diapered child, daycare attendee, or food handler), and if so, to prevent further transmission.
- ◆ To identify transmission sources of public health concern (e.g., a restaurant or a commercially-distributed food product), and to stop transmission from such sources.

B. Laboratory and Health Care Provider Reporting Requirements

Salmonellosis is reportable to the LBOH. The MDPH requests that health care providers immediately report to the LBOH in the community where the case is diagnosed, all confirmed or suspect cases of salmonellosis, as defined by the reporting criteria in Section 2A.

Laboratories performing examinations on any specimens derived from Massachusetts residents that yield evidence of *Salmonella* infection shall report such evidence directly to the MDPH within 24 hours.

C. Local Board of Health (LBOH) Reporting and Follow-Up Responsibilities*Reporting Requirements*

MDPH regulations (*105 CMR 300.000*) stipulate that salmonellosis is reportable to the LBOH and that each LBOH must report any confirmed case of salmonellosis or suspect case of salmonellosis, as defined by the reporting criteria in Section 2A. Cases should be reported to the MDPH Bureau of Communicable Disease Control, Office of Integrated Surveillance and Informatics Services (ISIS) using a MDPH *Enteric Disease Case Report Form* (found at the end of this chapter). Refer to the *Local Board of Health Timeline* at the end of this manual's *Introduction* section for information on prioritization and timeliness requirements of reporting and case investigation.

Case Investigation

1. It is the responsibility of the LBOH to complete an official MDPH *Enteric Disease Case Report Form* (found at the end of this chapter) by interviewing the case and others who may be able to provide pertinent information. Much of the information on the form can be obtained from the health care provider or from the medical record.
2. Use the following guidelines to assist in completing the form:
 - a. Accurately record the demographic information.
 - b. Accurately record all available clinical information, including onset date, symptoms, information regarding hospitalization, and clinician contact information.
 - c. Indicate *Salmonella* as the etiologic agent.
 - d. When asking about exposure history (e.g., food, travel, activities), if possible, use the entire incubation period range of Salmonellosis (6–72 hours). Specifically, however, focus on the 12–36 hours prior to the case's onset, which is the usual range.

- e. Record information pertaining to the case's possible exposures, including any restaurants at which the case ate as well as food item(s) consumed and date(s) of consumption. If you suspect that the case became infected through food, use the *MDPH Foodborne Illness Complaint Worksheet* (found at the end of this chapter) to facilitate recording additional information. It is requested that the LBOH fax or mail this worksheet to the MDPH Center for Environmental Health, Food Protection Program (FPP); see top of worksheet for fax number and address. This information is entered into a database to link complaints and to identify foodborne illness outbreaks. *Note: This worksheet does not replace the MDPH Enteric Disease Case Report Form.*
 - f. Ask questions about travel history and outdoor activities to help identify where the case became infected.
 - g. Ask questions about water supply because salmonellosis may be acquired as a result of a contaminated water supply, and record this information in the "Comments" section.
 - h. Household/close contact, pet or other animal contact, daycare, and food handler questions are designed to examine the case's risk of having acquired the illness as a result of related exposures or the case's potential for transmitting the illness to these contacts or in these settings. Ask specifically about exposure to reptiles. Determine whether the case attends or works at a daycare facility and/or is a food handler.
 - i. If you have made several attempts to obtain case information but have been unsuccessful (e.g., the case or health care provider does not return your calls or respond to a letter, or the case refuses to divulge information or is too ill to be interviewed), please fill out the form with as much information as you have gathered. Please note on the form the reason(s) why it could not be filled out completely.
3. After completing the form, attach laboratory report(s) and fax or mail (in an envelope marked "Confidential") to ISIS. The confidential fax number is (617) 983-6813. Call ISIS at (617) 983-6801 to confirm receipt of your fax. The mailing address is:

MDPH, Office of Integrated Surveillance and Informatics Services (ISIS)
305 South Street, 5th Floor
Jamaica Plain, MA 02130
Fax: (617) 983-6813

4. Institution of disease control measures is an integral part of case investigation. It is the responsibility of the LBOH to understand, and if necessary, institute the control guidelines listed in Section 4.



Section 4:

CONTROLLING FURTHER SPREAD

A. Isolation and Quarantine Requirements (*105 CMR 300.200*)

Food handlers with salmonellosis must be excluded from work.

Note: A case of salmonellosis is defined by the reporting criteria in Section 2A of this chapter.

Minimum Period of Isolation of Patient

After diarrhea has resolved, food handlers may only return to work after producing one negative stool specimen. If the case has been treated with an antimicrobial, the stool specimen shall not be collected until at least 48 hours after cessation of therapy. In outbreak circumstances, a second consecutive negative stool specimen will be required prior to returning to work.

Minimum Period of Quarantine of Contacts

Contacts with diarrhea who are food handlers shall be considered the same as a case and shall be handled in the same fashion. In outbreak circumstances, asymptomatic contacts who are food handlers shall be required to produce 2 negative stool specimens 24 hours apart. Otherwise, no restrictions.

Note: A food handler is any person directly preparing or handling food. This can include a patient care or childcare provider. See Glossary (at the end of this manual) for a more complete definition.

B. Protection of Contacts of a Case

None.

C. Managing Special Situations

Daycare

Since salmonellosis may be transmitted from person to person through fecal-oral transmission, it is important to follow-up on cases in daycare settings. General recommendations include:

- ◆ Children with *Salmonella* infection who have diarrhea should be excluded until their diarrhea is resolved.
- ◆ Children with *Salmonella* infection who have no diarrhea and are not otherwise ill may be excluded or may remain in the program if special precautions are taken.
- ◆ Most staff in childcare programs are considered food handlers. Those with *Salmonella* in their stool (symptomatic or not) can remain on site but must not prepare food or feed children until their diarrhea is gone and they have 1 negative stool test (collected at least 48 hours after completion of antibiotic therapy, if antibiotics are given) (per 105 CMR 300.200).

School

Since salmonellosis may be transmitted from person to person through fecal-oral transmission, it is important to follow up on cases in school settings. The MDPH *Comprehensive School Health Manual* provides detailed information on case follow-up and control in a school setting. General recommendations include:

- ◆ Students or staff with *Salmonella* infection who have diarrhea should be excluded until their diarrhea is resolved.
- ◆ Students or staff with *Salmonella* who do not handle food, have no diarrhea or have mild diarrhea, and are not otherwise sick may remain in school if special precautions are taken.
- ◆ Students or staff who handle food and have *Salmonella* infection (symptomatic or not) must not prepare food until their diarrhea is gone and they have 1 negative stool specimen (collected at least 48 hours after completion of antibiotic therapy, if antibiotics are given) (per 105 CMR 300.200).

Refer to Chapter 8 of the MDPH *Comprehensive School Health Manual* for complete guidelines on handling diseases spread through the intestinal tract.

Community Residential Programs

Actions taken in response to a case of salmonellosis in a community residential program will depend on the type of program and the level of functioning of the residents.

In long-term care facilities, residents with salmonellosis should be placed on standard (including enteric) precautions until their symptoms subside and they test negative for *Salmonella*. (Refer to the MDPH Division of Epidemiology and Immunization's *Control Guidelines for Long-Term Care Facilities* document for further actions. A copy can be obtained by calling the Division at (617) 983-6800 or (888) 658-2850 or on the MDPH website at www.mass.gov/dph.) Staff members who give direct patient care (e.g., feed patients, give mouth or denture care, or give medications) are considered food handlers and are subject to food handler restrictions under *105 CMR 300.200*. See Section 4A for more information. In addition, staff members with *Salmonella* infection who are not food handlers should consider not working until their diarrhea is resolved.

In residential facilities for the developmentally disabled, staff and clients with salmonellosis must refrain from handling or preparing food for other residents until their diarrhea has subsided and they have 1 negative stool specimen for *Salmonella* (collected at least 48 hours after completion of antibiotic therapy, if antibiotics are given) (per *105 CMR 300.200*). In addition, staff members with *Salmonella* infection who are not food handlers should consider not working until their diarrhea is resolved.

Reported Incidence Is Higher Than Usual/Outbreak Suspected

If the number of reported cases of salmonellosis in your city/town is higher than usual or if you suspect an outbreak, investigate to determine the source of infection and the mode of transmission. A common vehicle (e.g., water, food, or association with a daycare center) should be sought, and applicable preventive or control measures should be instituted. Control of person-to-person transmission requires special emphasis on personal hygiene and sanitary disposal of feces. Consult with the epidemiologist on-call at the MDPH Division of Epidemiology and Immunization at (617) 983-6800 or (888) 658-2850. The Division can help determine a course of action to prevent further cases and can perform surveillance for cases across town lines, which would otherwise be difficult to identify at the local level.

D. Preventive Measures

Environmental Measures

Implicated food items must be removed from consumption. A decision about testing implicated food items can be made in consultation with the FPP or the MDPH Division of Epidemiology and Immunization. The FPP can help coordinate pickup and testing of food samples. If a commercial product is suspected, the FPP will coordinate follow-up with relevant outside agencies. The FPP can be reached at (617) 983-6712.

Note: The role of the FPP is to establish policy and to provide technical assistance with the environmental investigation, such as interpreting the Massachusetts Food Code, conducting a Hazard Analysis and Critical Control Point (HACCP) risk assessment, initiating enforcement actions, and collecting food samples.

The general policy of the SLI is to test only food samples implicated in suspected outbreaks, not in single cases (except when botulism is suspected). The LBOH may suggest that the holders of food implicated in single case incidents locate a private laboratory that will test food or store the food in their freezer for a period of time in case

additional reports are received. However, in certain circumstances, a single, confirmed case with leftover food that had been consumed within the incubation period may be considered for testing.

Note: Refer to the MDPH Foodborne Illness Investigation and Control Reference Manual for comprehensive information on investigating foodborne illness complaints and outbreaks. Copies of this manual have been made available to the LBOH. It can also be located on the MDPH website in PDF format at www.mass.gov/dph/fpp/refman.htm. For the most recent changes to the Massachusetts Food Code, contact the FPP at (617) 983-6712 or through the MDPH website at www.mass.gov/dph/fpp.

Personal Preventive Measures/Education

To avoid exposure to *Salmonella*, recommend that individuals:

- ◆ Always wash their hands thoroughly with soap and water before eating or preparing food, after using the toilet, after changing diapers, and after touching pets or other animals (especially reptiles).
- ◆ Wash the child's hands as well as their own hands after changing diapers, and dispose of feces in a sanitary manner.
- ◆ Wash hands thoroughly and frequently when ill with diarrhea or when caring for someone with diarrhea. Hands should be scrubbed for at least 15–20 seconds after cleaning the bathroom; after using the toilet or helping someone use the toilet; after changing diapers; before handling food; and before eating.
- ◆ Keep food that will be eaten raw, such as vegetables, from becoming contaminated by animal-derived food products.
- ◆ Avoid letting infants or young children touch reptiles, such as turtles or iguanas, or their cages.
- ◆ If elderly or immunocompromised, avoid reptiles when choosing pets.
- ◆ In a daycare or school, do not use reptiles as classroom pets.
- ◆ Make sure to thoroughly cook all food products from animals, especially poultry and eggs, and avoid consuming raw or cracked eggs, unpasteurized milk, or other unpasteurized dairy products.

Discuss transmission risks that may result from oral-anal sexual contact. Latex barrier protection (e.g., dental dam) may prevent the spread of *Salmonella* to a case's sexual partners and may prevent exposure to and transmission of other fecal-oral pathogens.

***Salmonella* and Salmonellosis from Reptiles Public Health Fact Sheets are available from the MDPH Division of Epidemiology and Immunization or on the MDPH website at www.mass.gov/dph. Click on the “Publications and Statistics” link, and select the “Public Health Fact Sheets” section under “Communicable Disease Control.” The *Salmonella* Public Health Fact Sheet is also available in Spanish.**



ADDITIONAL INFORMATION

The formal CDC surveillance case definition for salmonellosis is the same as the criteria outlined in Section 2A of this chapter. (The CDC and the MDPH use the CDC case definitions to maintain uniform standards for national reporting.) For reporting to the MDPH, always use the criteria outlined in Section 2A.

Note: The most up-to-date CDC case definitions are available on the CDC website at www.cdc.gov/epo/dphsi/casedef/case_definitions.htm.



REFERENCES

American Academy of Pediatrics. [*Salmonella* Infections.] In: Pickering L.K., ed. *Red Book: 2003 Report of the Committee on Infectious Diseases, 26th Edition*. Elk Grove Village, IL, American Academy of Pediatrics; 2003: 541–547.

CDC. Case Definitions for Infectious Conditions Under Public Health Surveillance. *MMWR*. 1997; 46(RR-10).

“Salmonellosis: Frequently Asked Questions.” Centers for Disease Control and Prevention. September 27, 2004. <www.cdc.gov/ncidod/dbmd/diseaseinfo/salmonellosis_g.htm>.

Evans, A., Brachman, P., eds. *Bacterial Infections of Humans; Epidemiology and Control*. New York, Plenum Publishing, 1998.

Hennessy, T., et al. A National Outbreak of *Salmonella enteritidis* Infections from Ice Cream. *NEJM*. 1996; 334(20): 1281–1286.

Heymann, D., ed. *Control of Communicable Diseases Manual, 18th Edition*. Washington, DC, American Public Health Association, 2004.

MDPH. *The Comprehensive School Health Manual*. MDPH, January 1995.

MDPH. *Foodborne Illness Investigation and Control Reference Manual*. Massachusetts Department of Public Health. 1997. <www.mass.gov/dph/fpp/refman.htm>.

MDPH. *Regulation 105 CMR 300.000: Reportable Diseases, Surveillance, and Isolation and Quarantine Requirements*. MDPH, Promulgated November 4, 2005.



FORMS & WORKSHEETS

Salmonellosis (Non-Typhoid)

Salmonellosis (Non-Typhoid)



LBOH Action Steps

This form does not need to be submitted to the MDPH with the case report form. It is for LBOH use and is meant as a quick-reference guide to salmonellosis case investigation activities.

LBOH staff should follow these steps when salmonellosis is suspected or confirmed in the community. For more detailed information, including disease epidemiology, reporting, case investigation, and follow-up, refer to the preceding chapter.

- ☐ Notify the MDPH Division of Epidemiology and Immunization, at (617) 983-6800 or (888) 658-2850, to report any suspect or confirmed case(s) of salmonellosis.
- ☐ Obtain laboratory confirmation.
- ☐ For salmonellosis suspected to be the result of food consumption, complete a MDPH *Foodborne Illness Complaint Worksheet* and forward to the MDPH Center for Environmental Health, Food Protection Program (FPP).
- ☐ Contact the MDPH Division of Epidemiology and Immunization or the FPP to discuss whether or not to submit suspect foods for testing.
- ☐ Identify other potential exposure sources.
- ☐ Determine whether the case attends or works at a daycare facility and/or is a food handler.
- ☐ Identify other potentially exposed persons.
- ☐ Institute isolation and quarantine requirements (*105 CMR 300.200*) as they apply to a particular case.
- ☐ Fill out the case report form (attach laboratory results).
- ☐ Send the completed case report form (with laboratory results) to the MDPH Bureau of Communicable Disease Control, Office of Integrated Surveillance and Informatics Services (ISIS).